

## REMARKS

Applicants have amended Claims 33, 38, 39 and 55. Support for the present amendment can be found generally throughout the Specification. Applicants submit that no new matter has been added.

Additionally, as requested, Applicants have enclosed an Abstract of Disclosure as required under 37 C.F.R. §1.72(b).

### I. Claims Rejections - 35 U.S.C. § 112

The Office Action rejects Claims 33-64 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Office Action states that the limitation of "a low level of gel content" is indefinite. Applicants have amended Claim 33 to be directed to a "gel content below 250 ppm" and accordingly request withdrawal of this ground of rejection.

According to the Office Action, it is incorrect in Claims 39 and 41 to define a saturated hydrocarbon as "aromatic hydrocarbon" and "monolefinic hydrocarbon". Applicants have amended Claims 38 and 39 to state "wherein said organic solvent is selected from." Therefore Applicants request withdrawal of this ground of rejection.

According to the Office Action, the limitation of "C<sub>2</sub>-C<sub>18</sub> non conjugated dienes" is erroneous in Claim 46 because a non-conjugated diene requires at least five carbons. Applicants respectfully traverse the Office Action's statement and assert that a non-conjugated diene can contain less than five carbon atoms, for instance 1,2 butadiene, which has three carbon atoms. Accordingly, Applicants request withdrawal of this ground of rejection.

According to the Office Action, the "0%" lower limitation of R<sub>3</sub>Al in Claim 57 lacks antecedent basis because Claim 57 requires component (b) to be more than 0% to be a mixture. Applicants have amended Claim 55 to state a (I) is (a) or a mixture of (a) and (b), and accordingly, request withdrawal of this ground of rejection.

*1,2 - allene*

**II. Rejection under 35 U.S.C. §102(b)/103(a)**

Claims 33-40, 44 and 48-54 were rejected under 35 U.S.C. § 102(b) as anticipated by, or in the alternative, under § 103(a) as obvious over Matsuda, et al. (U.S. Patent No. 5,109,082). Applicants respectfully traverse this ground of rejection.

Amended Claim 33 is directed to a process for the production of cis-1,4-polybutadiene having a gel content below 250 ppm, comprising polymerizing 1,3-butadiene in the presence of a catalyst and a polymerization diluent, wherein the polymerization diluent comprises an organic solvent and water particles having a median particle size less than or equal to about 10 µm. Claims 34-40, 44 and 48-54 are dependent upon Claim 33.

Applicants submit that in order to anticipate a claim, the prior art reference must teach each and every element of the claimed invention, either expressly or inherently. Also, Applicants respectfully submit that "in order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all the claims limitations. The teachings or suggestions to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicants' disclosure." See MPEP § 2142, citing In re Vaeck, 947 F.2d 488, 20 USPQ 2d. 1438 (Fed. Cir. 1991).

Applicants respectfully submit that Matsuda, et al. fails to teach each and every element of the claimed invention and Matsuda, et al. fails to motivate one skilled in the art to arrive at the instant invention. Matsuda, et al. discloses a process for producing cis-1,4-polybutadiene with gelation inhibited. Matsuda, et al. teaches polymerizing 1,3-butadiene in the presence of a halogen containing organoaluminum compound, a transition metal compound and water. As illustrated in the Examples, Matsuda, et al. also requires the presence of a gelation inhibitor. Also, Applicants submit that Matsuda, et al. fails to teach or suggest or even motivate one skilled in the art to arrive at a process preparing a cis-1,4, polybutadiene having a **gel content of less than 250 ppm.**

*Applicant's process does not exclude gelation inhibitor.*

According to the Office Action, Matsuda, et al. teaches that the water is introduced to the polymerization media through a porous filter with a diameter of 5 microns or less and therefore, a skilled artisan would have expected the size of the water particles dispersed in the organic solvent to be around about 2 to 5 microns. Applicants submit, despite Examiner's assertion, even if the water droplets disclosed in Matsuda, et al. are pressed through a filter, they will tend to immediately coalesce and grow bigger when dispersed in the hydrocarbon, i.e., the water particles in the hydrocarbon according to Matsuda, et al. have a particle size greater than 10  $\mu\text{m}$ . Accordingly, Applicants submit that Matsuda, et al. is also silent to the fact that the polymerization diluent comprises an organic solvent and water particles having a median particle size less than or equal to about 10  $\mu\text{m}$ , Matsuda, et al. merely discloses that water is passed through a 5 micron or less porous filter prior to be dispersed in the inert organic solvent. Therefore, Applicants submit that Matsuda, et al. fails to teach or suggest the present invention, and accordingly, Applicants request withdrawal of this ground of rejection. *2um was used in Ex. 1, coalesce: is in Matsuda's filter is for disperse water in particle form*

### **III. Rejection under 35 U.S.C. §103(a)**

Claims 39-47, 55-62 and 64 were rejected under 35 U.S.C. § 103(a) as obvious over Matsuda, et al. (U.S. Patent No. 5,109,082) in view of Tsujimoto, et al. (U.S. Patent No. 5,905,125). Applicants respectfully traverse this ground of rejection.

Claims 39-47, 55-62 and 64 are also dependent upon Claim 33.

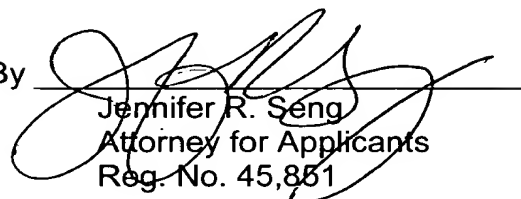
Applicants submit that Matsuda, et al. in view of Tsujimoto, et al. fails to suggest the present invention. As previously discussed above, Matsuda, et al. does not teach or suggest a process for the production of cis-1,4-polybutadiene wherein the polymerization diluent comprises an organic solvent and water particles having a median particle size less than or equal to about 10  $\mu\text{m}$ .

Applicants submit that the deficiencies of Matsuda, et al. are not overcome by the combination of Matsuda, et al. and Tsujimoto, et al. Tsujimoto, et al. does not teach or suggest a process for the production of cis-1,4-polybutadiene wherein the polymerization diluent comprises an organic solvent and **water particles having a median particle size less than or equal to about 10  $\mu\text{m}$** . Tsujimoto, et al. discloses adding water in small amount, but does not teach or suggest that the water particles have a particle size less than or equal to 10  $\mu\text{m}$ . Accordingly, Applicants submit that even if the references were combined, the combination does not teach or

suggest each limitation of the present invention. Therefore, Applicants request withdrawal of this ground of rejection.

Respectfully submitted,

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the Claims:**

Please amend the Claims as follows:

33. (Amended) A process for the production of cis-1,4-polybutadiene having a ~~low level of~~ gel content below 250 ppm, comprising polymerizing 1,3-butadiene in the presence of a catalyst and a polymerization diluent, wherein the polymerization diluent comprises an organic solvent and water particles having a median particle size less than or equal to about 10  $\mu\text{m}$ .

38. (Amended) The process of Claim 37, wherein ~~said the aliphatic compound~~ organic solvent is selected from the group consisting of a saturated hydrocarbon, an unsaturated hydrocarbon and mixtures thereof.

39. (Amended) The process of Claim 38, wherein the ~~saturated hydrocarbon~~ organic solvent is selected from the group consisting of a  $\text{C}_4\text{-C}_{10}$  aliphatic hydrocarbon, a  $\text{C}_5\text{-C}_{10}$  cyclic aliphatic hydrocarbon, a  $\text{C}_6\text{-C}_9$  aromatic hydrocarbon, a  $\text{C}_2\text{-C}_{10}$  monoolefinic hydrocarbon and mixtures thereof.

55. (Amended) The process of Claim 48, wherein the organo-~~aluminium~~ aluminum halide compound is selected from:

(I) ~~a mixture of~~

(a) an alkyl ~~aluminum~~ aluminium chloride selected from the group consisting of diethyl ~~aluminum~~ aluminium chloride and ethyl ~~aluminum~~ aluminium sesquichloride,

~~and or~~ a mixture of :

(a) and

(b) an organo ~~aluminum~~ aluminium compound corresponding to the formula:



wherein:

R: represents a  $\text{C}_8\text{-C}_{12}$  alkyl group;

and

- (II) an alkyl ~~aluminum~~<sup>aluminium</sup> chloride wherein the alkyl group has from 8 to 12 carbon atoms.

On new page 18, please add the following:

--GEL REDUCTION IN HIGH CIS-1,4-POLYBUTADIENE

PRODUCTION PROCESS

ABSTRACT OF THE DISCLOSURE

The present invention relates to a process for the production of cis-1,4-polybutadiene having a low gel content. The process includes polymerizing 1,3-butadiene in the presence of a catalyst and a polymerization diluent. According to the present invention, the diluent contains an organic solvent and water particles having a median particle size less than or equal to about 10  $\mu\text{m}$ .--